Environmental Baseline Survey

Reconstruction of the Cargo Ferry Terminal

Sardinas Bay

Culebra, Puerto Rico

Prepared For:

PUERTO RICO PORTS AUTHORITY

Prepared By:

ATKINS

Technical Memorandum

ATKINS

To:	Arturo Santiago		
From:	Francisco Pérez Aguiló	**Email:**	Francisco.Perez@atkinsglobal.com
Phone:	(787) 294-2010	**Date:**	December 6, 2013
Ref:	Job 100037049	**cc:**	File, PRPA
Subject:	Culebra Cargo Ramp Environmental Baseline Survey		

Introduction and Proposed Project

Pursuant to the emergency situation that occurred at the Culebra Passenger Ferry Terminal Platform after the passing of Hurricane Earl on August 30, 2010, Atkins Caribe was asked to evaluate the structural condition of the Culebra passenger terminal platform and the Culebra cargo terminal ramp. A site visit was conducted in August 2010 to observe the conditions of these structures and a report, dated September 20, 2010, was submitted to Maritime Transport Authority of Puerto Rico (MTAPR).

The evaluation of the structural condition of the cargo terminal revealed deterioration of the deck slab and concrete beams. While it may be possible to patch and repair the deteriorated structure, any repairs attempted for this facility would be of short-term duration. The inspection revealed that the corrosion observed in the deck slab has probably spread to the entire concrete surface. The deterioration appears to be a result of previous storm events/hurricanes and wave action. If repair/reconstruction of the cargo terminal is not conducted promptly, the potential exists for structural failure. As the only heavy commercial cargo transportation port in Culebra, the cargo ferry provides a crucial service to the residents of the island. The Puerto Rico Ports Authority (PRPA) has requested Federal Emergency Management Agency (FEMA) funds, under the Hazard Mitigation Grant Program (HMGP), for reconstruction/repair of the cargo platform of the Municipality of Culebra.

The PRPA designed the cargo ramp in 1986 and construction was completed circa 1988. No reconstruction of the cargo ramp has been accomplished since. The cargo ramp is currently comprised of a reinforced 12-inch thick concrete slab on top of steel H-section support pilings. The proposed project will include a partial re-construction of the existing concrete platform. Demolition/construction activities will be limited to the existing pier footprint and the existing pilings will likely be encased or reinforced. This document presents the findings of the environmental resource survey conducted in November 2013.

Survey Methodology

The field effort for the environmental baseline survey was conducted on November 12-13, 2013. Water clarity was good and wave action was minimal at the time of the survey. A preliminary reconnaissance of the project area was conducted prior to data collection. The preliminary reconnaissance allowed the survey team to identify the habitat types present within the project area and to determine the most suitable methodologies for assessing the benthic communities and environmental resources.

Coral Survey. The preliminary reconnaissance revealed that no Acroporid corals are present within the survey area. Thus, it was not necessary that National Marine Fisheries Service's (NMFS) *Acropora* spp. survey protocol be conducted at the project location. Because the survey was being conducted for the purposes of estimating impacts from the proposed construction, it was determined that the documentation of individual coral colonies would provide the most valuable information in terms of estimating and minimizing impacts to the coral community. Thus, field efforts focused on identifying and mapping those coral colonies larger than or equal to (≥) 10 cm in diameter. The ultimate goal of these mapping efforts was to estimate impacts to the coral community and to determine potential avoidance/minimization and mitigation options.

As shown in Figure 1 (attached), the cargo ramp has nine existing steel H-section support pilings that receive some sun exposure (and thus the potential for coral colonization). The preliminary reconnaissance revealed that no corals were located on the shaded pilings beneath the cargo ramp concrete slab. A sheet pile seawall abuts the southeastern edge of the existing cargo ramp (Figure 1, attached). As construction plans for the proposed project have not yet been produced, Atkins biologists determined that the location of the corals on the seawall should also be documented. In the event that construction should impact a portion of the existing seawall, documented locations of the corals on the seawall would allow for avoidance and/or minimization of impacts to these corals.

Atkins biologists conducted a thorough visual inspection of each of the nine pilings, as well as the entire seawall, to document the presence of coral colonies. For those coral colonies ≥10 cm in diameter, the following information was recorded:

- Location information (i.e., piling number and piling face/position along the seawall)
- Coral species
- Colony dimensions (length, width, height)
- Depth from the top of piling or sheet pile seawall
- Additional comments (colony health, etc.)

The location of the corals documented on the support pilings included the piling number and face of the four-sided piling (i.e., north/south/east/west face). The location of corals documented on the seawall was estimated by counting the number of ridges along the sheet pile seawall (running from the northwest corner to the southeast corner, as shown in Figure 1, attached). For example, a coral at location "Seawall - 2" is located on the second ridge in the sheet pile, as counted from the north-western corner. There were a total of 38 ridges along the existing seawall. Corals were identified to the species level, where possible, and the dimensions (length, width, height) of each colony were measured using a ruler (Image 1a) and recorded. The depth of each coral colony was determined by deploying a measuring tape from the top of the piling (or top of the sheet pile seawall) to the bottom of the coral colony (Image 1b). Comments related to the health of the coral colony were also noted (e.g., partial mortality of the colony, overgrowth by macroalgae, etc.). A photograph of each colony was also collected.

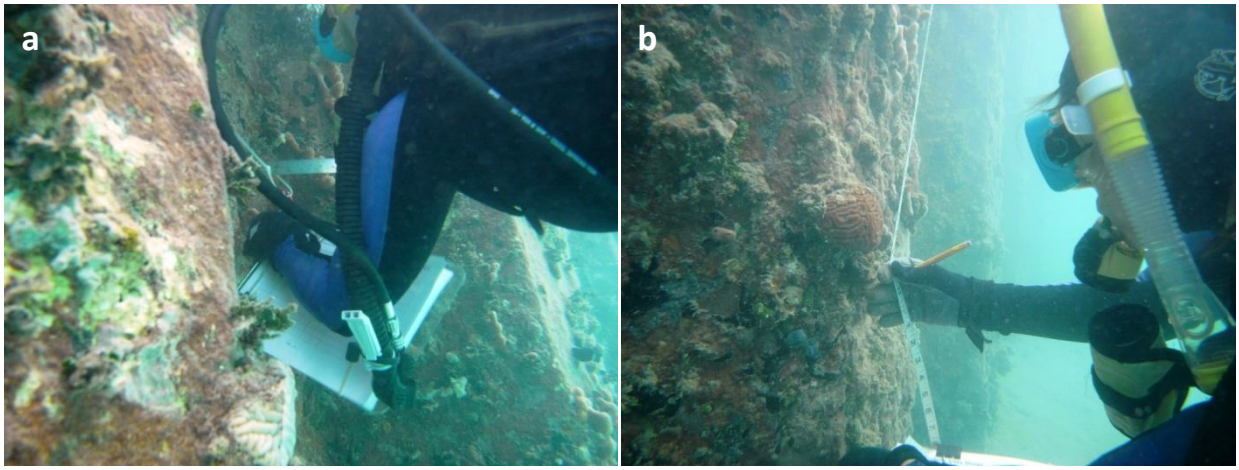


Image 1 (a) Diver measuring coral colony dimensions, (b) Diver taking depth measurement of a coral colony located on the seawall.

Seagrass Mapping. To document the location of existing seagrass beds within the vicinity of the proposed project, Atkins biologists first conducted a preliminary reconnaissance swim using snorkelling equipment to identify the relative location of seagrass beds in the area. After the preliminary reconnaissance, the seagrass edge-of-bed was documented by Atkins biologists. One biologist swam directly above the edge of bed, followed closely behind by a snorkeler collecting geospatial data using a

Garmin GPSmap 276C handheld GPS unit. Observations of the seagrass species composition of each seagrass bed were also recorded.

Survey Results

General Condition of the Cargo Ramp Structure. During the preliminary reconnaissance, substantial structural deterioration of the existing cargo ramp was noted. Observed deterioration included delamination of the underside of the concrete slab and severe spalling of the outer layer of concrete. Disruption in the tension cord of the slab was also observed, which indicated greatly reduced capacity of the wharf structure. The steel H-section support piles exhibited advanced pitting and corrosion of the steel that has resulted in section loss of the member. Photographs of these observed conditions are included in Appendix A.

***General Condition of the Survey Area*.** The benthic substrate immediately adjacent to the cargo ramp structure consisted mainly of a mix of rock rubble intermixed with small amounts of sand (Image 2a). Sand and rock rubble were also observed adjacent to the seawall located immediately southeast of the cargo ramp structure (Image 2b). With the exception of very small colonies of encrusting *Siderastrea radians* observed on the rock rubble and a single colony on the substrate between Pilings 2 and 3 (refer to *Coral Survey* section below for additional information), no corals were observed on the substrate adjacent to the cargo ramp and seawall.

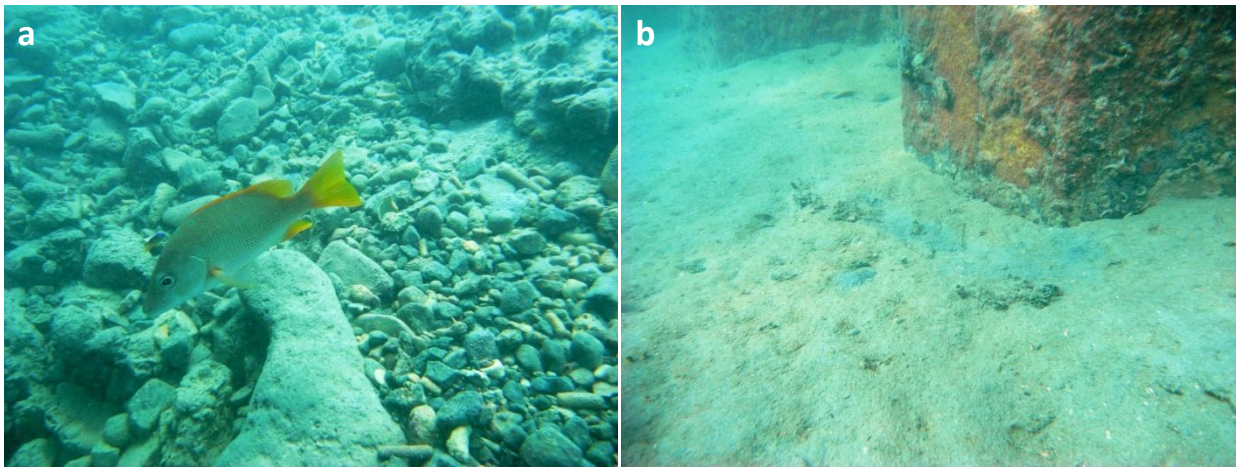


Image 2 (a) Rock rubble found in the vicinity of the cargo ramp; (b) Sand substrate adjacent to the base of the seawall.

Moving away from the cargo ramp, the substrate transitioned to sandy habitat where seagrasses are present (refer to *Seagrass Mapping* section below for more information). In addition, a very large dome-shaped colony of *Siderastrea siderea* was observed in shallow water northwest of the cargo ramp structure (Image 3). The location of this colony is shown in Figure 1 (attached).

Image 3. Large colony of *Siderastrea siderea* observed northwest of the cargo ramp/platform.

The cargo ramp support piles and the seawall were encrusted with a diverse invertebrate community comprised of varied organisms, including corals, sponges, tunicates, macro algae, crustose coralline algae, bryozoans, worms, snails, urchins, etc. Image 4 (a-d) shows some photographs of the invertebrate community.

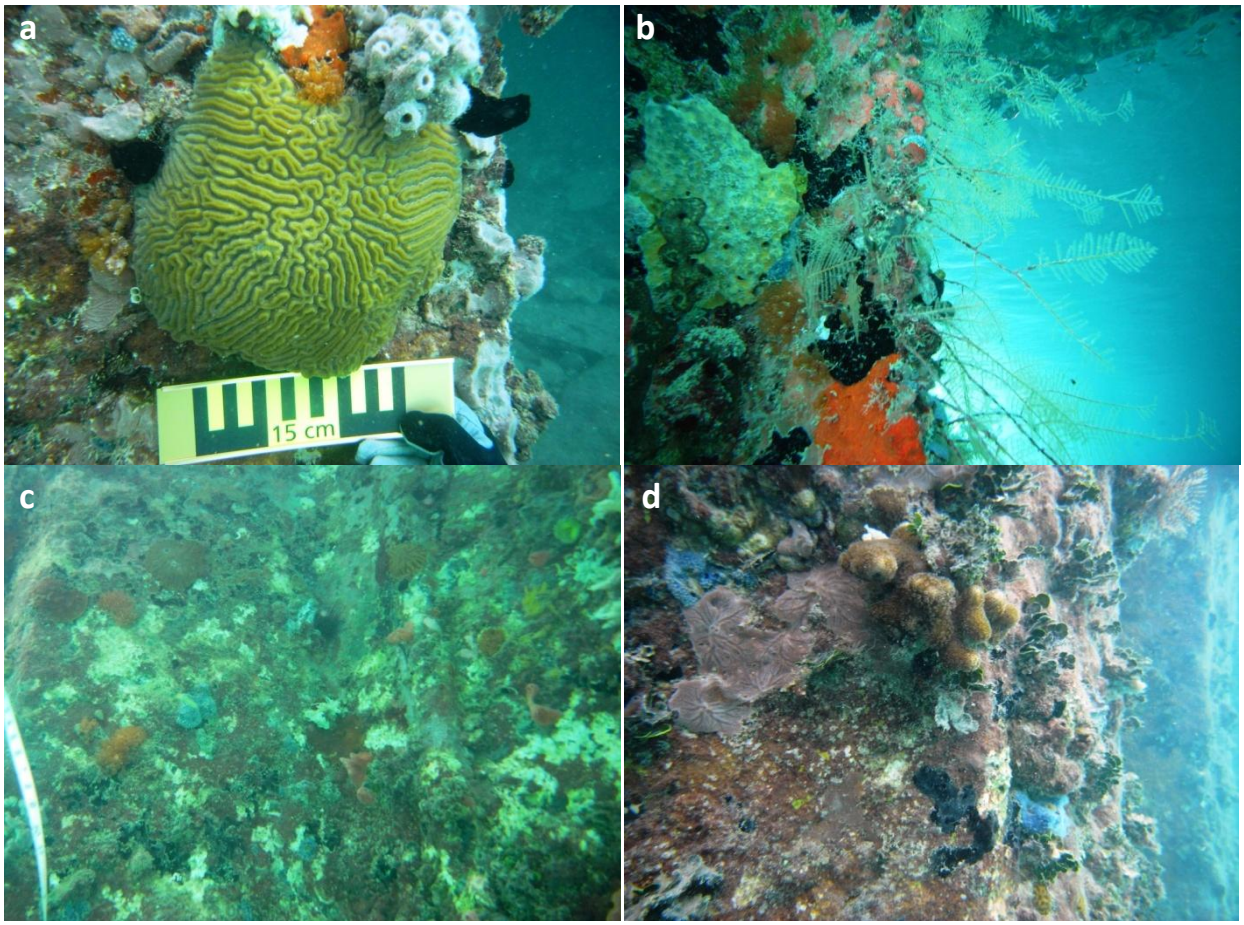


Image 4. Coral and other invertebrates colonizing the cargo ramp support pilings (a & b) and the sheet pile seawall (c & d).

Coral Survey. A total of eighty coral colonies (≥10 cm in diameter) were documented during the coral survey. These eighty colonies included the following species of coral: *Diploria strigosa, D. clivosa, D. labrynthiformis, Colpophyllia natans, Meandrina meandrites, Eusmilia fastigiata, Porites astreoides*, *P. porites,* and *Agaricia* sp. It should be noted that based upon the morphological similarity of corals within the *Agaricia* genus, these colonies weren't identified to species level (magnification is often needed to distinguish between species in the *Agaricia* genus). The eighty coral colonies include:

- One colony on the hardbottom substrate beneath the edge of existing cargo ramp, between Pilings 2 and 3,
- Ten colonies located on Pilings 5, 6, 8, and 9, and
- Sixty nine colonies located on the seawall.

Photographs of all eighty coral colonies are included in Appendix B. Table 1 (see pages 8-10) shows the information recorded for each of the eighty coral colonies. In addition to those coral species listed above, colonies of *Favia fragum* were observed; however, all colonies of *F. fragum* had dimensions of <10 cm in diameter (Image 5).

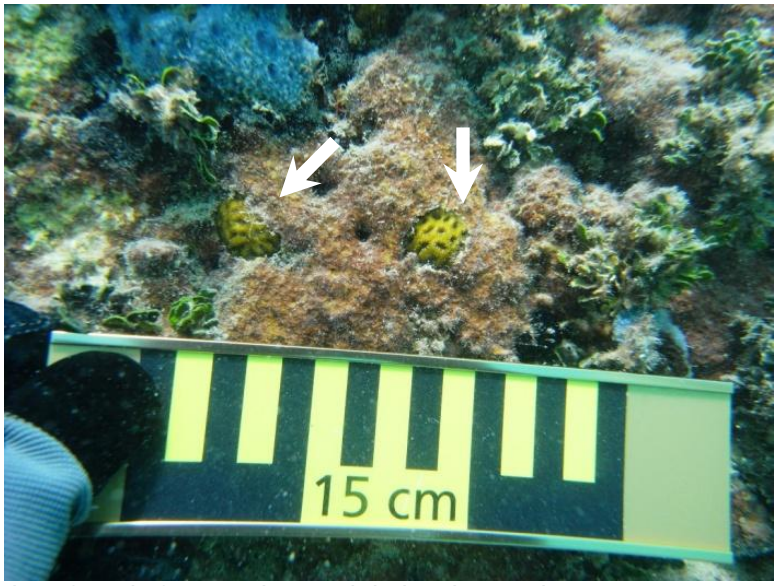


Image 5. Small colonies of *Favia fragum* observed during the coral survey.

Seagrass Edge of Bed Mapping. Seagrass beds were observed northwest/west and southwest of the existing cargo ramp structure. Figure 1 (attached) shows the edge of seagrass beds documented during the November field survey. The seagrass bed located northwest/west of the existing cargo ramp was dominated by *Syringodium filiforme* (manatee grass) mixed with *Thalassia testudinum* (turtle grass) and *Halophila decipiens* (paddle grass). The seagrass bed located southwest of the existing cargo ramp was comprised of *S. filiforme*. The seagrass bed to the northwest is dense *Syringodium filiforme* (50-100%). The edges of the bed are mainly *Halophila decipiens* which is not as dense (25-50%). The area to the south is much less dense *Syringodium* sp. in deeper water (5-25%).

Discussion

As the proposed construction activities will likely include the partial re-construction of the existing concrete slab and encasement/reinforcement of the existing cargo ramp pilings, it is anticipated that impacts to 12 of the 80 coral colonies will not be avoidable. These 12 corals include the single colony (Coral #1) located on the hardbottom substrate beneath the edge of existing cargo ramp between Pilings 2 and 3; the 10 colonies located on Pilings 5, 6, 8, and 9 (Corals #2-6 and #35-39); and the single colony

located on the sheet pile seawall beneath the existing concrete slab (Coral #40). Figure 2 (attached) shows the approximate location of each of these 12 coral colonies.

Three (3) of the 12 corals that will likely be impacted belong to the genus *Agaricia*. These coral colonies were not identified to species level, based upon the morphological similarity of corals within this genus (i.e., magnification is often needed to distinguish between agaricid species). The potential exists that these three colonies may be *Agaricia lamarcki*, which the NMFS has proposed for listing as a Threatened Species under the Endangered Species Act (77 FR 73219). The three *Agaricia* sp. colonies are located on Piling 6 (Coral #35, Image 6a), Piling 8 (Coral #38, Image 6b), and on the seawall beneath the existing concrete slab (Coral #40, Image 6c), as shown on Figure 2 (attached).

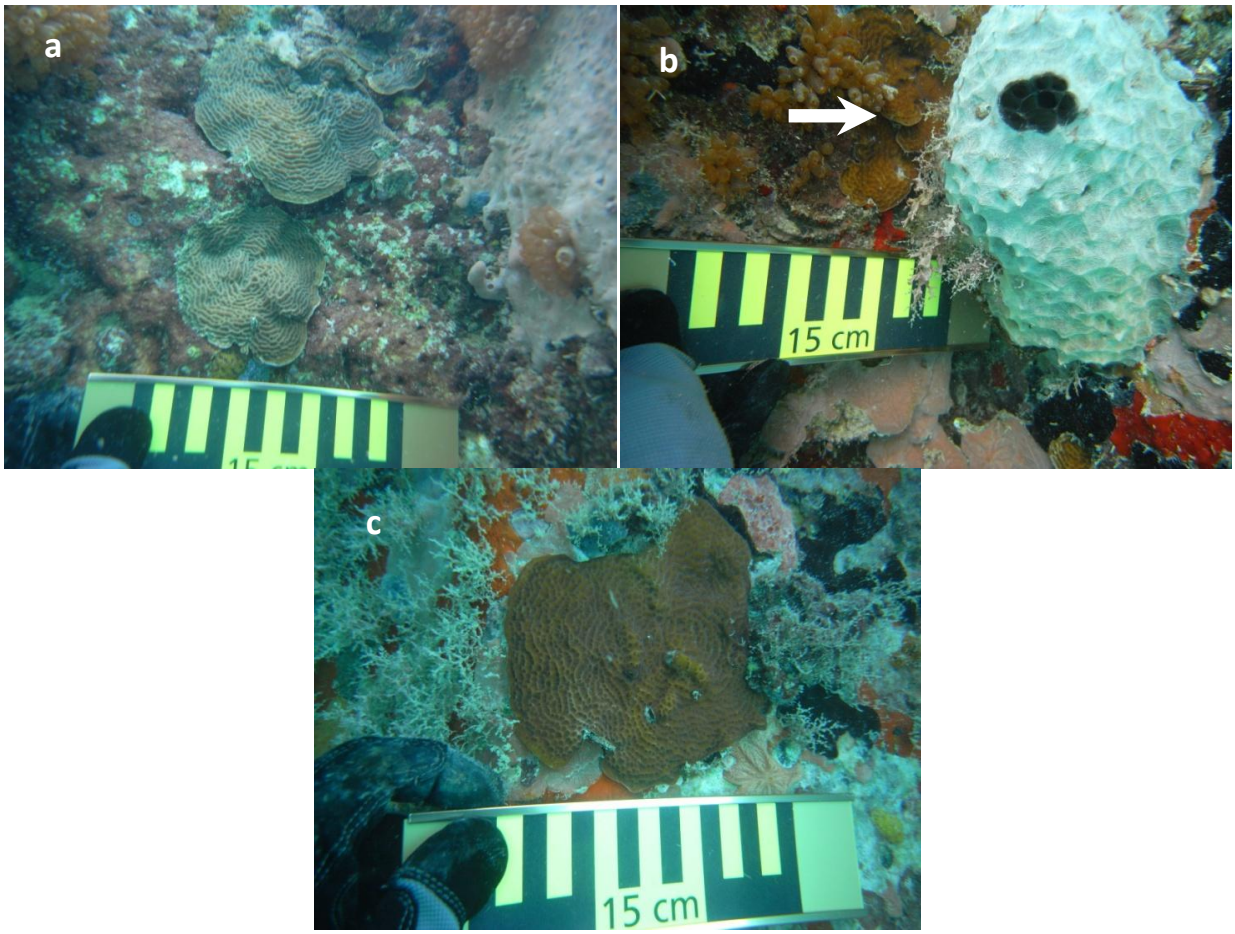


Image 6 (a) Coral #35 located on Piling 6; (b) Coral #38 located on Piling 8; (c) Coral #40 located on the seawall beneath the existing concrete slab

It is anticipated that construction activities will likely be conducted from a barge anchored southwest of the existing cargo ramp. As depicted in Figure 1 (attached), seagrass beds were observed northwest/west and southwest of the existing cargo ramp structure and a large colony of *Siderastrea siderea* was also observed northwest of the cargo ramp. Additionally, 69 coral colonies (≥10 cm in diameter) were documented on the sheet pile seawall that abuts the eastern edge of the existing cargo ramp (Figure 1, attached). Impacts to these resources (seagrasses and corals) should be avoided during construction activities. Construction barges should be positioned in a location that will not impact or shade these seagrasses and corals, including the large *S. siderea* colony and the corals located on the seawall. Barge anchoring/spudding locations should be selected to avoid these resources.

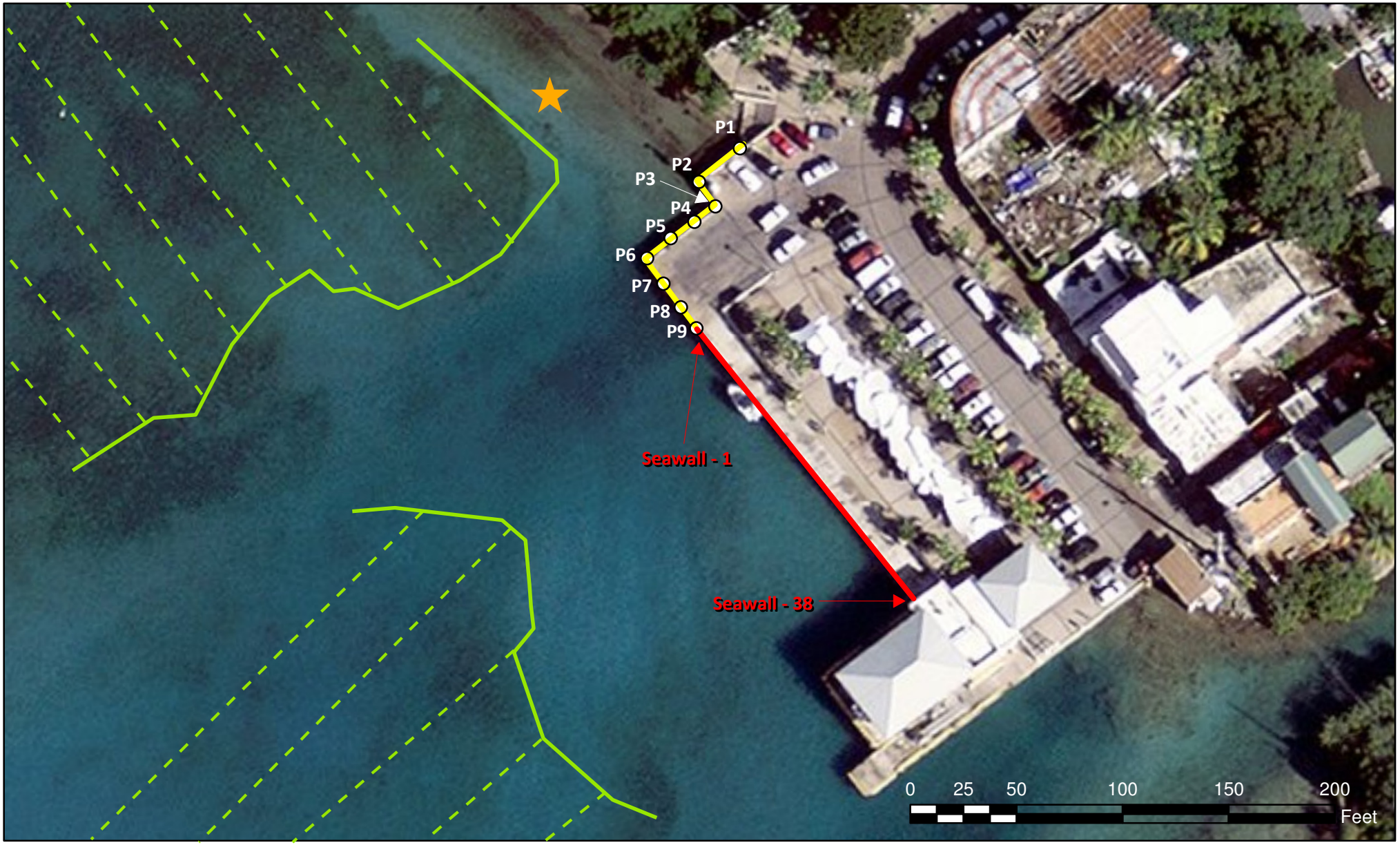
As discussed above, impacts to 12 corals will be unavoidable for the proposed project. It is likely that the NMFS PRD and HCD will require development of a Mitigation Plan demonstrating the PRPA's commitment to avoid and minimize impacts to corals and seagrasses from the proposed project. Atkins anticipates that the Mitigation Plan will need to include a coral relocation plan, as well as committed methodologies to avoid and minimize impacts to seagrasses and water quality during construction. Prior to construction, those potentially impacted corals that can potentially be removed from the pilings without substantial damage to the coral organism would need to be removed and reattached to a suitable recipient site in the project vicinity.

Table 1. Information recorded for each of the coral colonies (≥10 cm in diameter) located on the cargo ramp and on the seawall located southeast of the cargo ramp. Corals that will potentially be impacted by the proposed project are shown in **bold** text.

			Coral Colony Dimensions				
Coral No.	Location	Species	Length (cm)	Width (cm)	Height (cm)	Colony Depth (cm)	Comments
1	**Harbottom between Piling 2 and 3**	***Diploria clivosa***	**44**	**46**	**12**	**122**	**Healthy**
2	**Piling 5 - West**	***Diploria strigosa***	**21**	**19**	**4**	**135**	**Healthy**
3	**Piling 5 - West**	***Diploria clivosa***	**32**	**33**	**7**	**109**	**Healthy**
4	**Piling 6 - South**	***Diploria strigosa***	**47**	**44**	**16**	**142**	**Healthy - boring worms**
5	**Piling 8 - South**	***Diploria labrynthiformis***	**22**	**27**	**12**	**264**	**Healthy**
6	**Piling 8 - South**	***Diploria strigosa***	**43**	**43**	**11**	**122**	**Healthy - boring worms**
7	Seawall - 2	*Porites astreoides*	18	10	4	287	Healthy
8	Seawall - 2.5	*Colpophyllia natans*	16	12	2	175	Partial mortality (20%)
9	Seawall - 3.5	*Meandrina meandrites*	17	16	3	191	Healthy
10	Seawall - 3.5	*Diploria strigosa*	20	12	2	147	Partial mortality (30%)
11	Seawall - 4	*Eusmilia fastigiata*	16	14	10	216	Partial mortality (40%)
12	Seawall - 6.5	*Diploria strigosa*	15	14	2	112	Healthy
13	Seawall - 7	*Porites porites*	21	14	8	180	Partial mortality (60%)
14	Seawall - 8	*Diploria clivosa*	25	23	2	81	Healthy
15	Seawall - 9	*Diploria strigosa*	22	20	5	74	Healthy
16	Seawall - 10	*Eusmilia fastigiata*	17	15	10	259	Partial mortality (15%)
17	Seawall - 13.5	*Porites porites*	19	8	12	221	Healthy
18	Seawall - 16.5	*Diploria strigosa*	17	14	2	117	Healthy
19	Seawall - 17.5	*Diploria strigosa*	17	16	2	137	Healthy
20	Seawall - 18	*Diploria strigosa*	18	18	2	102	Healthy
21	Seawall - 19	*Diploria labrynthiformis*	16	16	5	257	**Partial macroalgae overgrowth**
22	Seawall - 19	*Diploria clivosa*	21	19	4	89	Healthy
23	Seawall - 19.5	*Diploria strigosa*	19	17	2	91	Healthy
24	Seawall - 21	*Diploria strigosa*	16	16	2	206	Healthy
25	Seawall - 22	*Diploria clivosa*	38	39	4	97	Healthy
26	Seawall - 23	*Diploria strigosa*	16	15	2	173	Healthy
27	Seawall - 23.5	*Colpophyllia natans*	21	20	3	145	Healthy
28	Seawall - 25	*Diploria labrynthiformis*	15	14	4	165	Healthy
29	Seawall - 26	*Diploria strigosa*	20	17	3	183	Healthy
30	Seawall - 27	*Diploria labrynthiformis*	24	21	8	86	Healthy
31	Seawall - 27	*Porites astreoides*	22	15	5	196	**Partial macroalgae overgrowth**, boring worms
32	Seawall - 29	*Meandrina meandrites*	19	17	6	79	Healthy

Coral No.	Location	Species	Coral Colony Dimensions				Comments
			Length (cm)	Width (cm)	Height (cm)	Colony Depth (cm)	
33	Seawall - 31	*Diploria strigosa*	16	15	2	132	Healthy
34	Seawall - 34	*Diploria labrynthiformis*	20	17	5	109	Healthy
35	**Piling 6 - West**	***Agaricia* sp.**	**13**	**10**	**1**	**147**	**Healthy**
36	**Piling 6 - West**	***Diploria strigosa***	**23**	**23**	**7**	**97**	**Partial macroalgae overgrowth**
37	**Piling 6 - West**	***Diploria strigosa***	**13**	**13**	**3**	**79**	**Partial macroalgae overgrowth**
38	**Piling 8 - East**	***Agaricia* sp.**	**13**	**9**	**1**	**208**	**Healthy, behind a sponge**
39	**Piling 9 - South**	***Porites astreoides***	**11**	**8**	**1**	**264**	**Healthy**
40	**Seawall - Underneath dock**	***Agaricia* sp.**	**14**	**12**	**1**	**N/A**	**Healthy**
41	Seawall - 1.5	*Colpophyllia natans*	10	9	4	117	Healthy
42	Seawall - 1.5	*Diploria labrynthiformis*	12	10	2	229	Healthy
43	Seawall - 2	*Colpophyllia natans*	10	8	2	259	**Partial macroalgae overgrowth**
44	Seawall - 3.5	*Agaricia* sp.	13	8	1	94	**Partial macroalgae overgrowth**
45	Seawall - 3	*Agaricia* sp.	11	7	1	109	Healthy
46	Seawall - 4	*Diploria strigosa*	14	14	2	155	Healthy
47	Seawall - 4	*Diploria strigosa*	11	10	1	79	Healthy
48	Seawall - 4	*Diploria strigosa*	11	9	2	163	Healthy
49	Seawall - 3.5	*Eusmilia fastigiata*	12	11	7	292	Partial mortality (15%)
50	Seawall - 5.5	*Agaricia* sp.	12	10	1	102	Partial macroalgae overgrowth
51	Seawall - 6.5	*Agaricia* sp.	10	7	1	287	Healthy
52	Seawall - 9	*Portites porites*	12	6	7	127	Partial macroalgae overgrowth
53	Seawall - 11	*Diploria labrynthiformis*	12	9	6	236	Healthy
54	Seawall - 12	*Diploria strigosa*	12	9	1	178	Healthy
55	Seawall - 18	*Diploria strigosa*	10	11	1	142	Healthy
56	Seawall - 19	*Colpophyllia natans*	10	9	5	178	Healthy
57	Seawall - 19.5	*Diploria strigosa*	11	9	2	163	Partial macroalgae overgrowth
58	Seawall - 22	*Diploria strigosa*	14	13	2	150	Healthy
59	Seawall - 22	*Diploria strigosa*	14	11	3	122	Healthy
60	Seawall - 22	*Diploria strigosa*	12	7	2	86	Healthy
61	Seawall - 23	*Diploria strigosa*	10	11	1	183	Healthy
62	Seawall - 23.5	*Diploria strigosa*	14	9	2	127	Healthy
63	Seawall - 24	*Diploria strigosa*	12	11	1	208	Healthy
64	Seawall - 24.5	*Porites astreoides*	13	9	2	173	Healthy
65	Seawall - 26	*Diploria strigosa*	12	9	2	191	Healthy
66	Seawall - 28.5	*Diploria strigosa*	13	12	7	122	Partial macroalgae overgrowth
67	Seawall - 28.5	*Diploria strigosa*	12	8	2	150	Healthy
68	Seawall - 30	*Diploria strigosa*	13	13	2	114	Healthy
69	Seawall - 31	*Diploria strigosa*	13	13	12	117	Healthy

Coral No.	Location	Species	Coral Colony Dimensions				Comments
			Length (cm)	Width (cm)	Height (cm)	Colony Depth (cm)	
70	Seawall - 31.5	*Diploria strigosa*	13	13	1	185	Healthy
71	Seawall - 31.5	*Porites astreoides*	14	11	2	307	Partial macroalgae overgrowth
72	Seawall - 33	*Diploria strigosa*	13	13	2	89	Healthy
73	Seawall - 33.5	*Diploria strigosa*	13	10	2	112	Healthy
74	Seawall - 34	*Porites astreoides*	11	9	1	234	Healthy
75	Seawall - 34	*Agaricia* sp.	12	10	1	183	Partial macroalgae overgrowth
76	Seawall - 34.5	*Agaricia* sp.	11	9	1	102	Partial macroalgae overgrowth
77	Seawall - 36.5	*Diploria strigosa*	11	8	1	211	Healthy
78	Seawall - 37	*Diploria strigosa*	12	9	1	201	Healthy
79	Seawall - 37.5	*Diploria strigosa*	10	8	1	300	Healthy
80	Seawall - 38	*Diploria strigosa*	12	12	2	262	Partial macroalgae overgrowth



Culebra Cargo Ramp, Culebra, Puerto Rico

Culebra Cargo Ramp
Culebra, Puerto Rico

Culebra Cargo Ramp
Environmental Baseline Survey

- Cargo Ramp Structure
- Estimated Piling Locations
- Seawall
- *Siderastrea siderea colony*
- Seagrass Edge of Bed

Figure 1. Cargo ramp structure, seawall, and benthic resource map. Note the dashed lines extending from seagrass edge of bed do not show geographical extent but location of seagrass relative to edge.

Prepared By: Atkins Ecological Sciences

ATKINS

Date: December 4, 2013

Culebra Cargo Ramp, Culebra, Puerto Rico

Culebra Cargo Ramp
Culebra, Puerto Rico

Culebra Cargo Ramp
Environmental Baseline Survey

○ Estimated Piling Locations

* indicates possible colony of A. lamarcki, a proposed Threatened species

Figure 2. Location of 12 coral colonies likely impacted during construction. Refer to Table 1 for additional coral data.

1 in = 20 feet

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Date: December 4, 2013

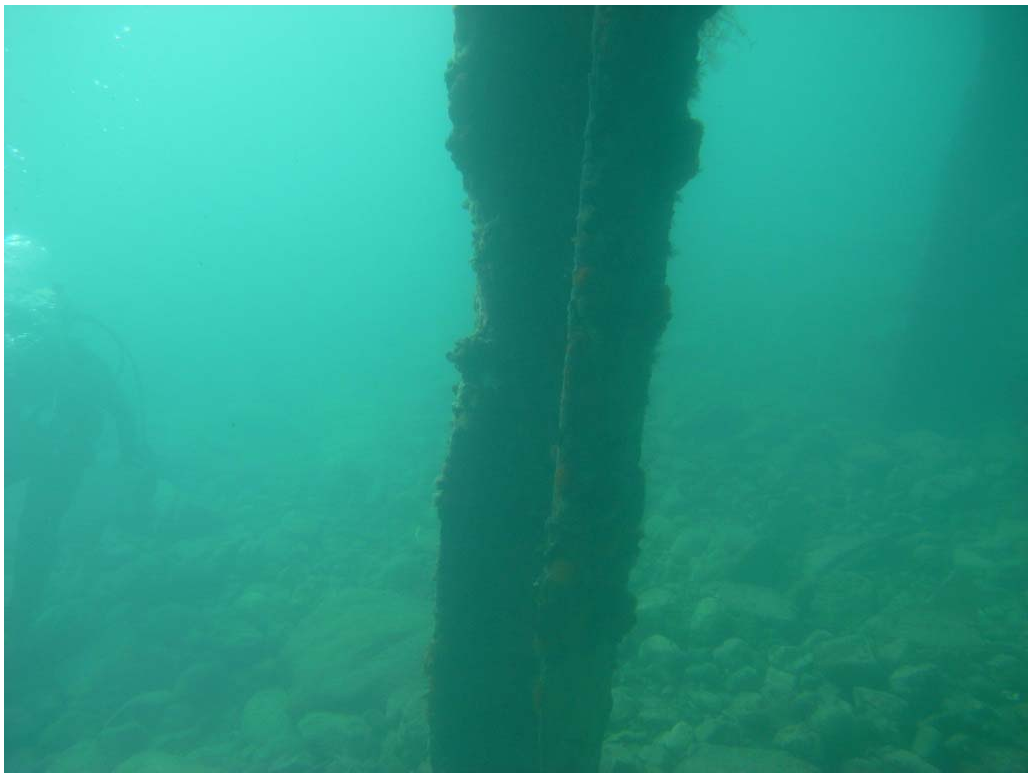
Appendix A

View of Culebra Cargo Platform/Ramp looking southeast.

Closeup view of spalling observed on the outer edge of the concrete slab.

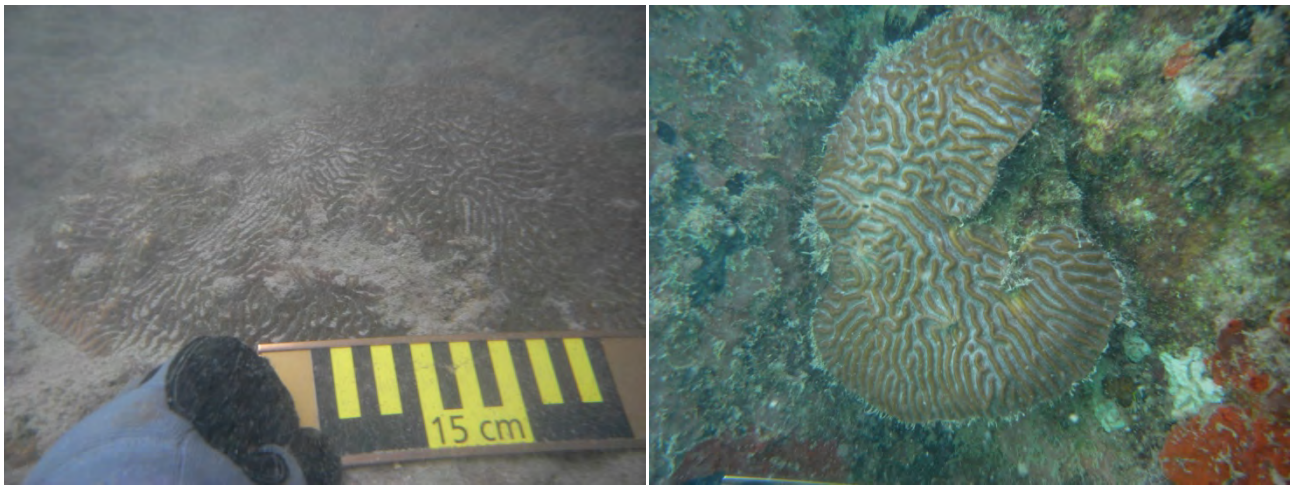
View of the underside of the concrete slab showing delamination and severe spalling of the outer layer of concrete. Also shows missing and severely corroded tension reinforcement.

View of the underside of the ramp showing delamination and disruption of the tension cord of the concrete slab.



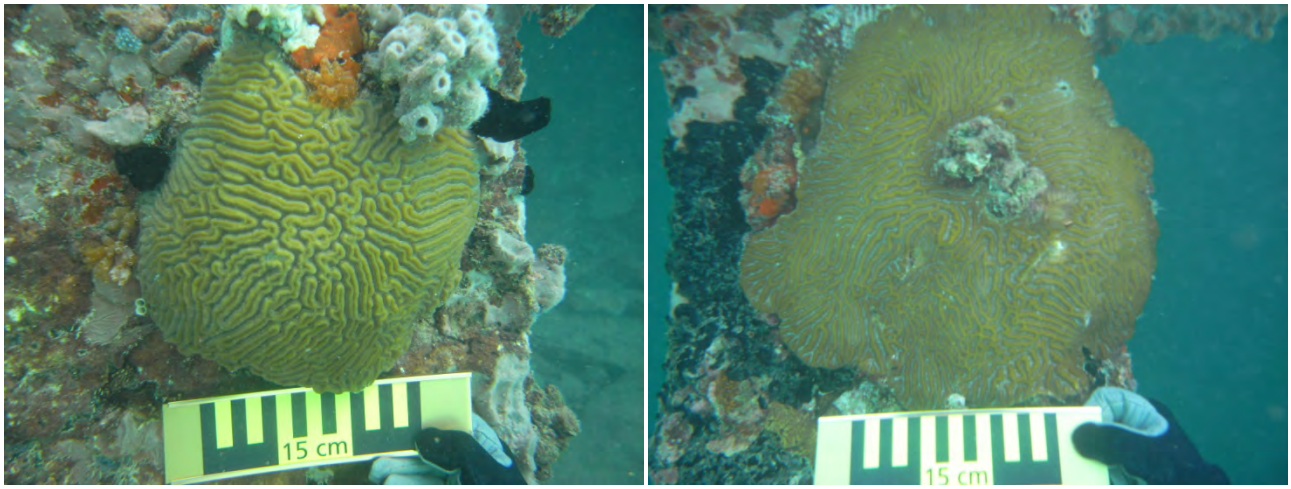
View of section loss of the steel support piles for the cargo ramp.

Appendix B



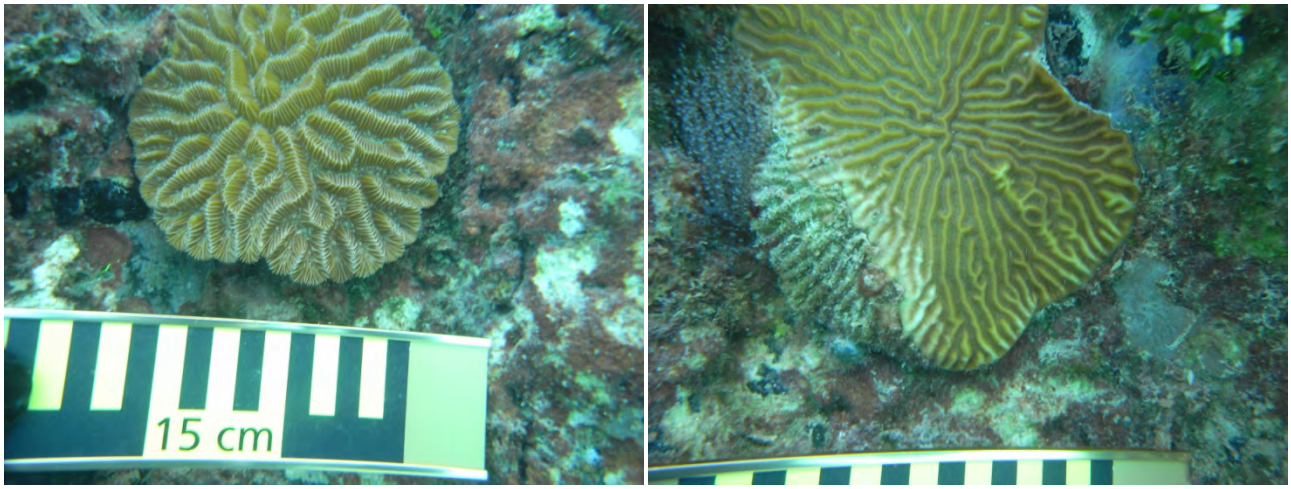
Coral #1 (left), located on the substrate between Piling 1 and Piling 2. Coral #2 (right) located on Piling 5.

Coral #3 (left) located on Piling 5 and Coral #4 (right) located on Piling 6.

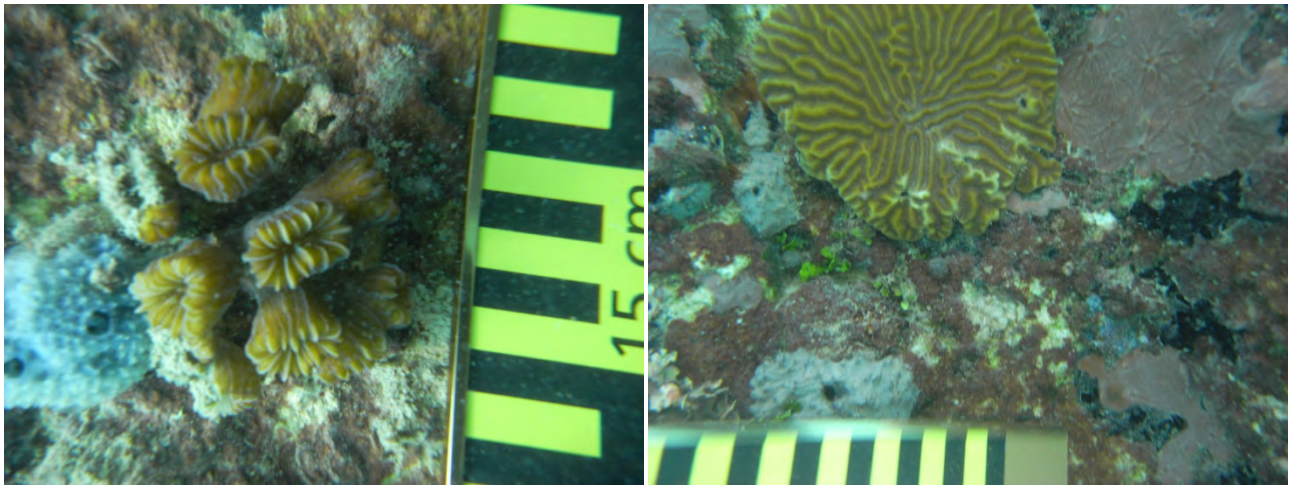


Coral #5 (left) and Coral #6 (right) located on Piling 8.

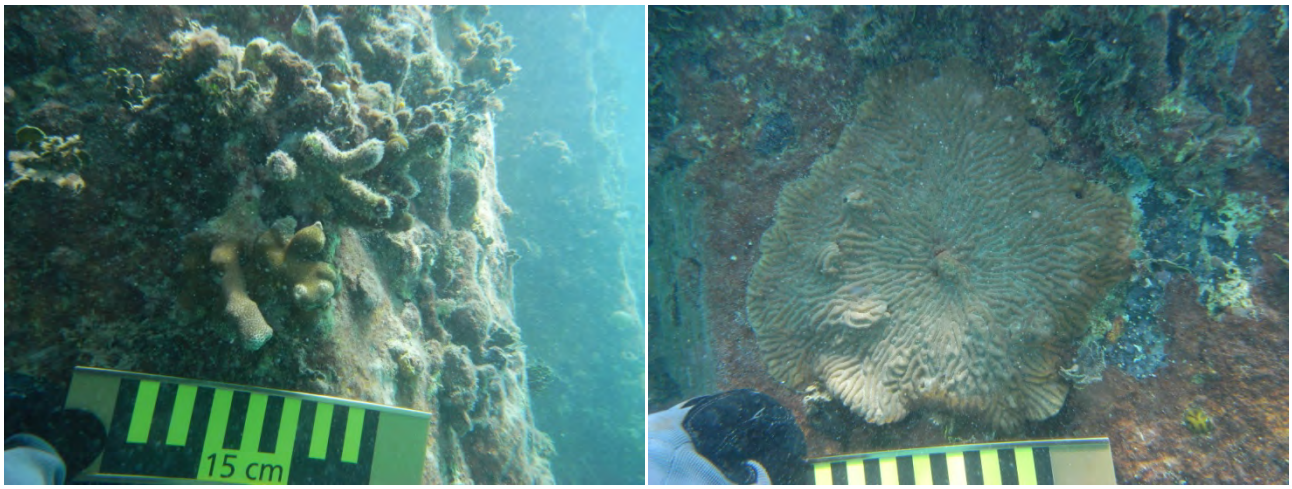
Coral #7 (left) and Coral #8 (right) located on the seawall.



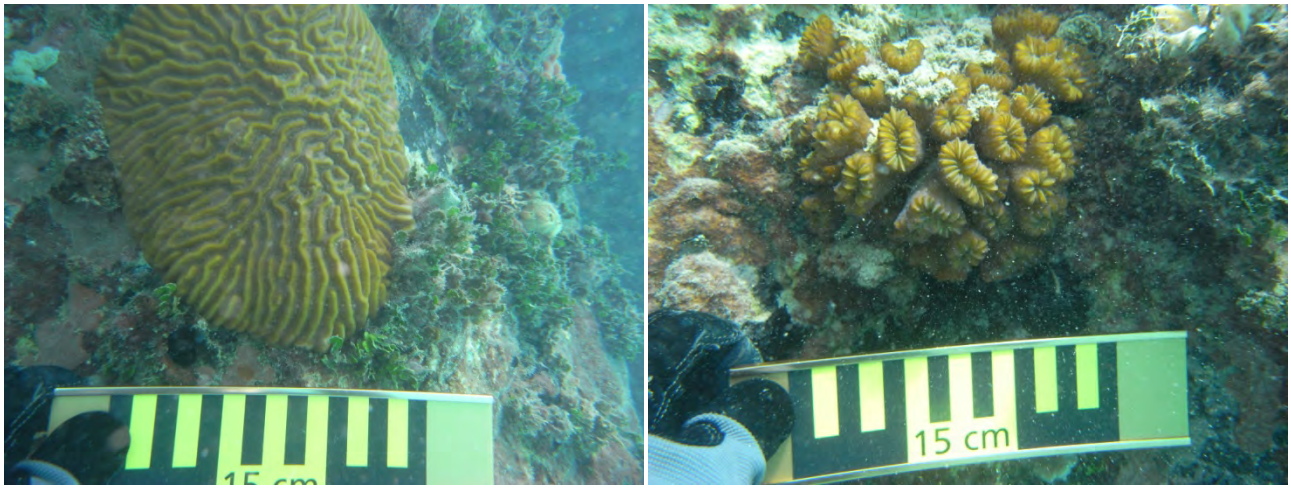
Coral #9 (left) and Coral #10 (right) located on the seawall.



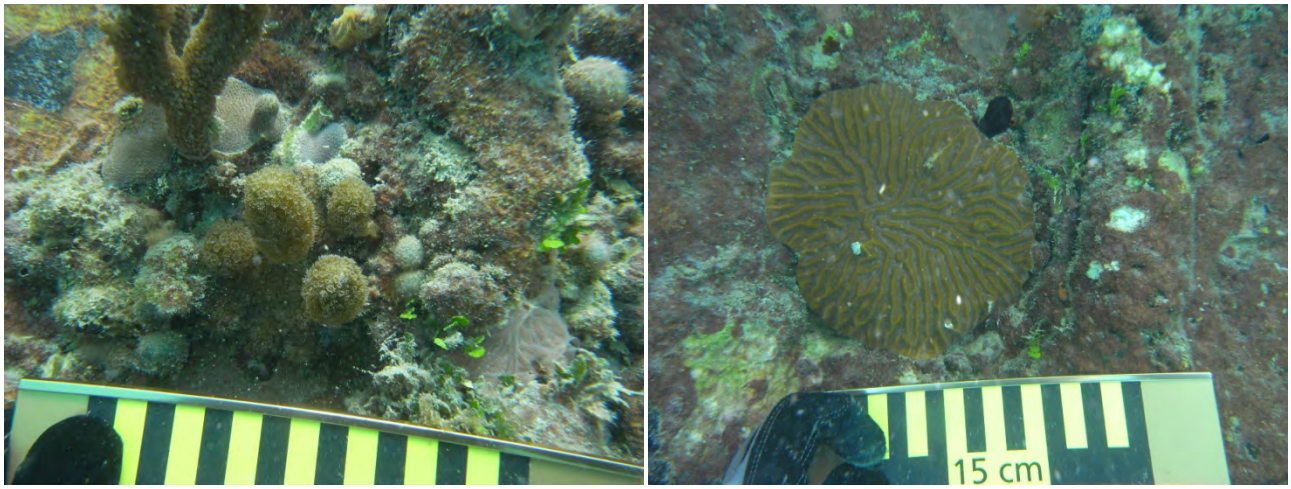
Coral #11 (left) and Coral #12 (right) located on the seawall.



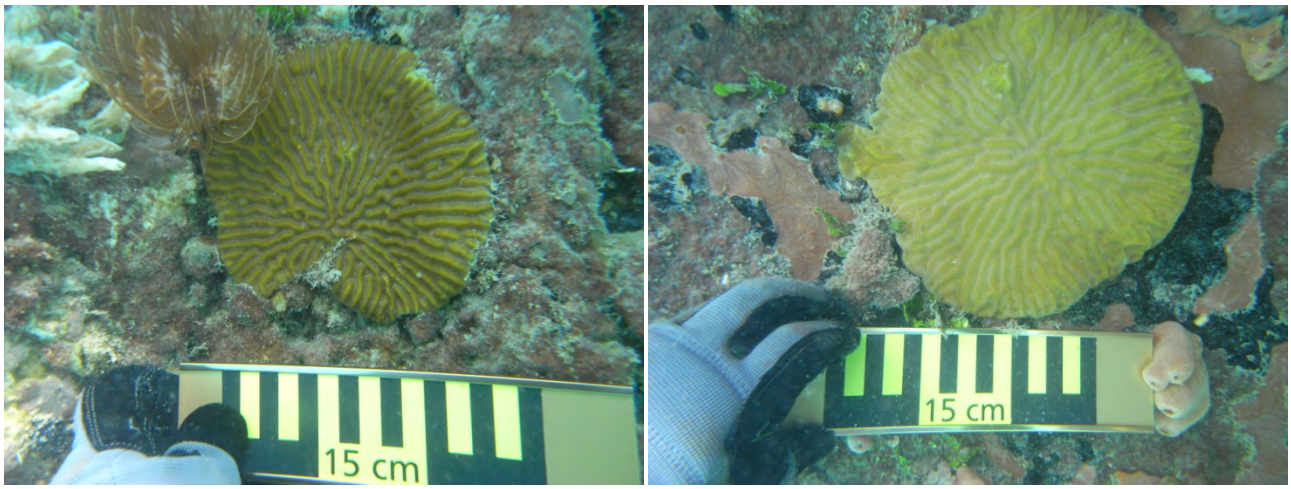
Coral #13 (left) and Coral #14 (right) located on the seawall.



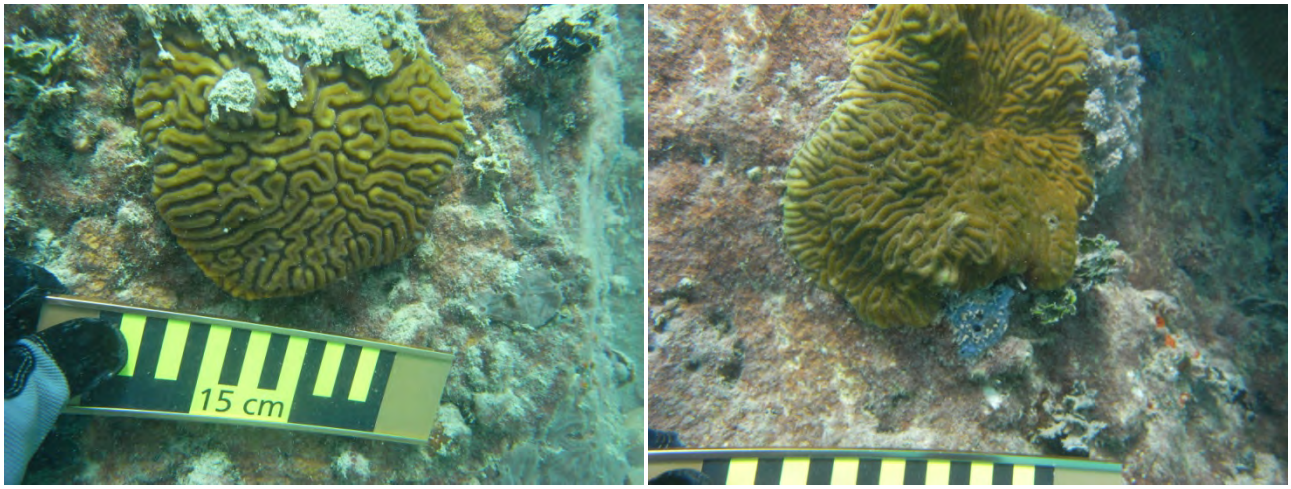
Coral #15 (left) and Coral #16 (right) located on the seawall.



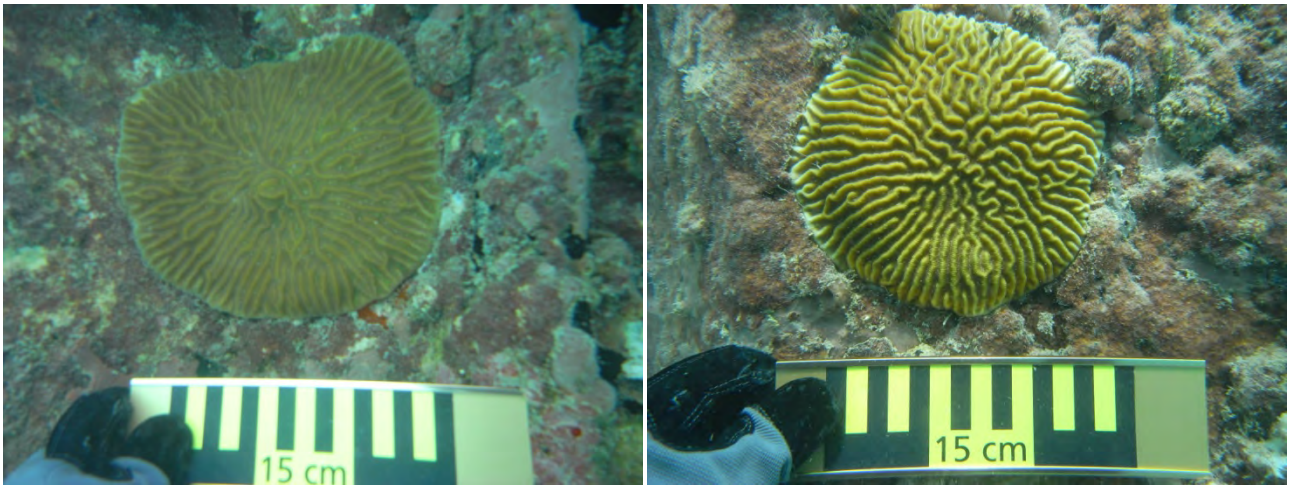
Coral #17 (left) and Coral #18 (right) located on the seawall.



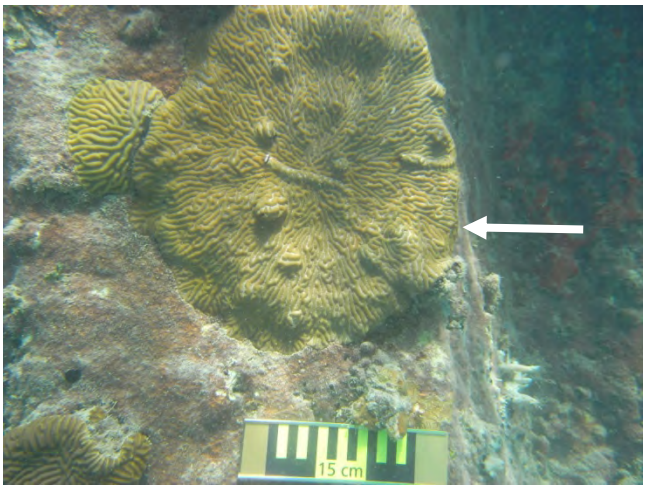
Coral #19 (left) and Coral #20 (right) located on the seawall.

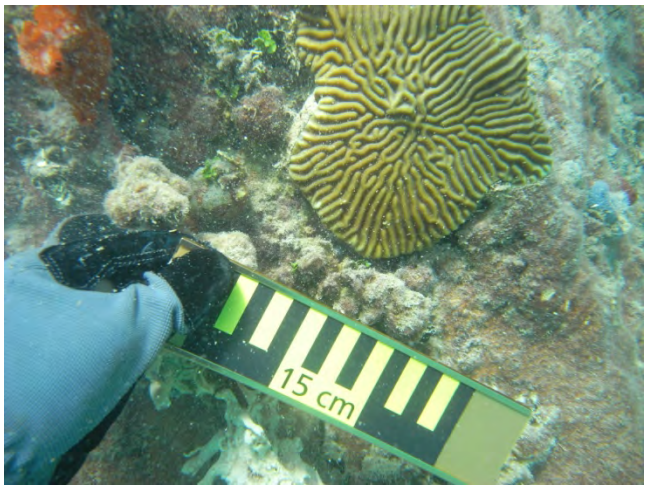


Coral #21 (left) and Coral #22 (right) located on the seawall.

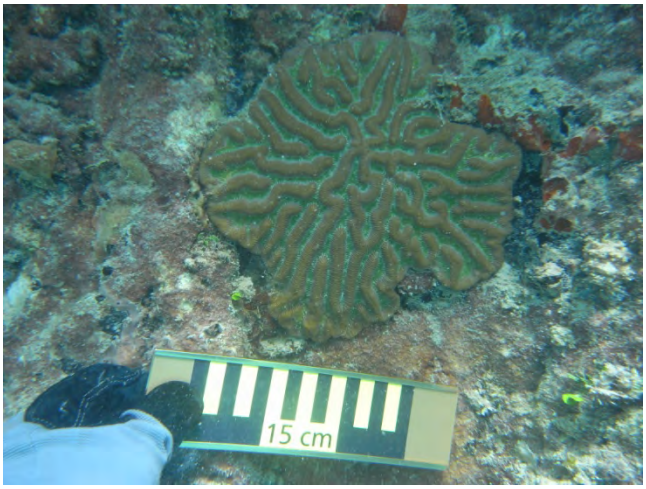


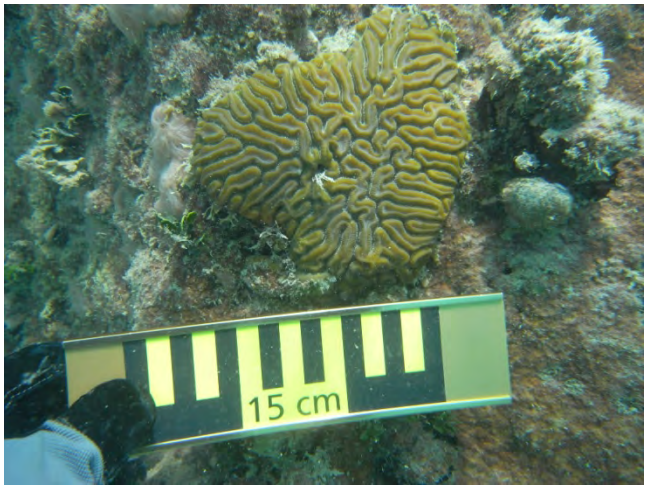
Coral #23 (left) and Coral #24 (right) located on the seawall.



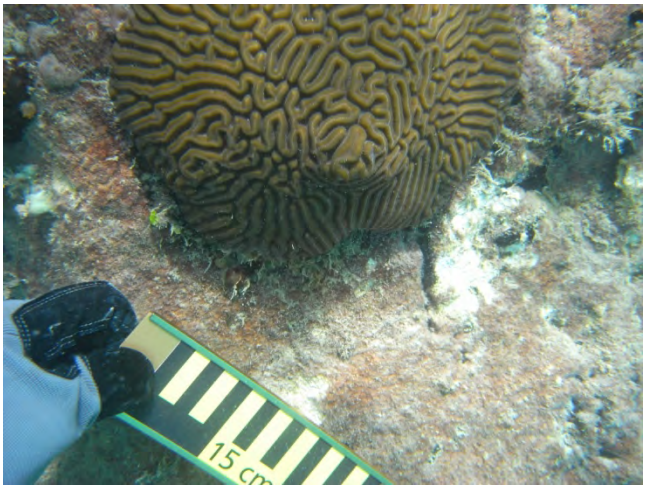


Coral #25 (left) and Coral #26 (right) located on the seawall.

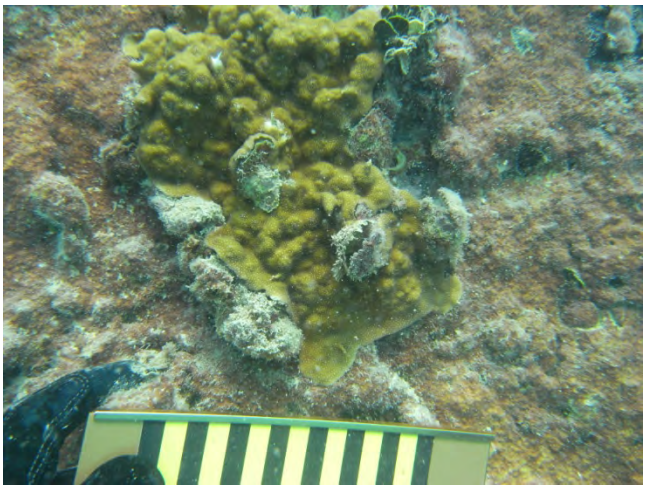
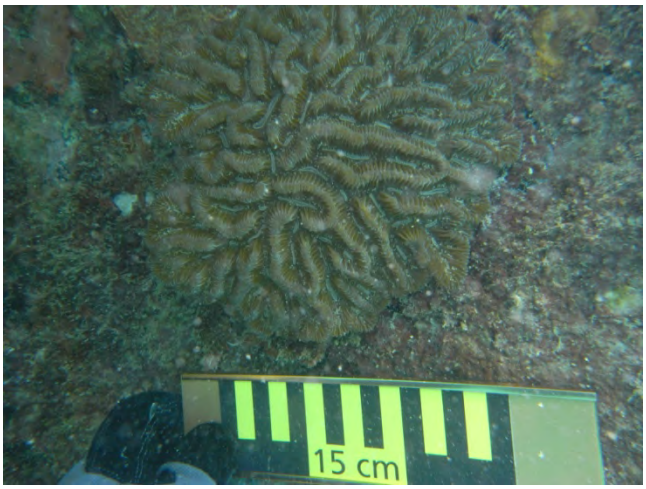




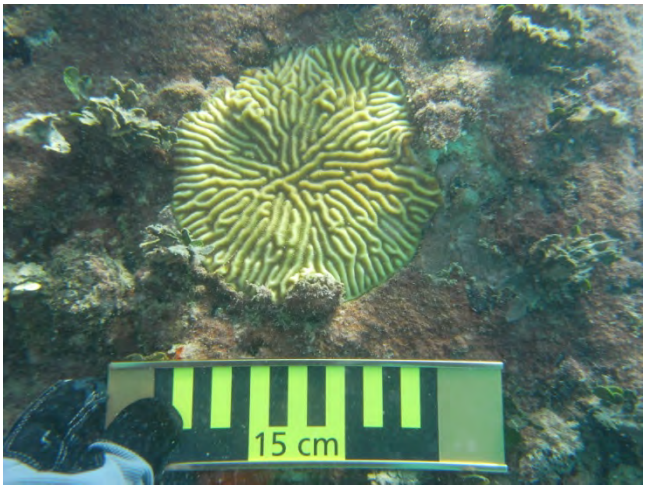
Coral #27 (left) and Coral #28 (right) located on the seawall.



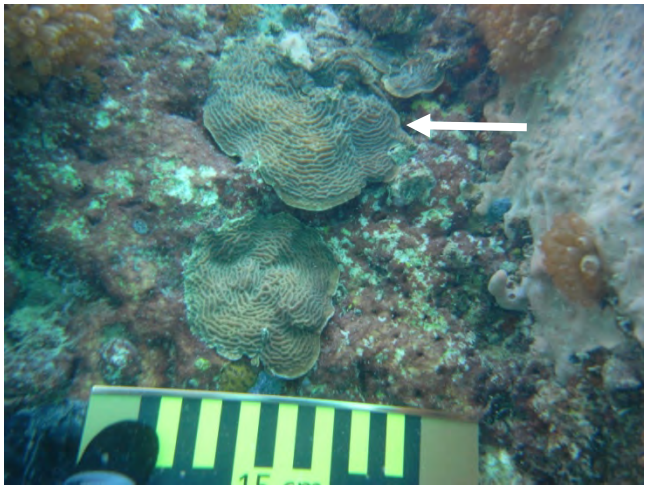
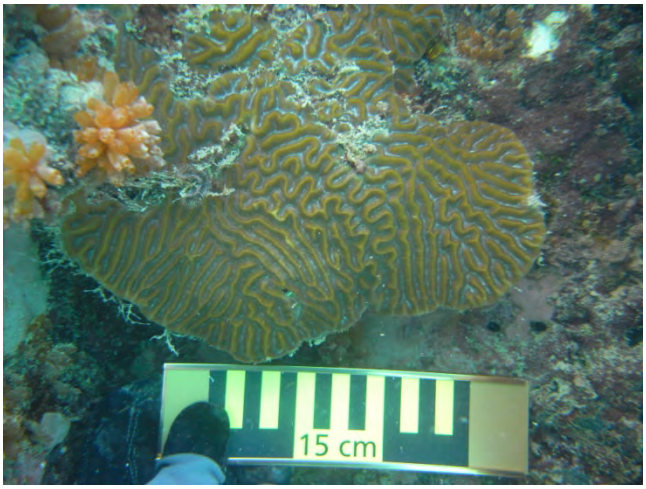
Coral #29 (left) and Coral #30 (right) located on the seawall.

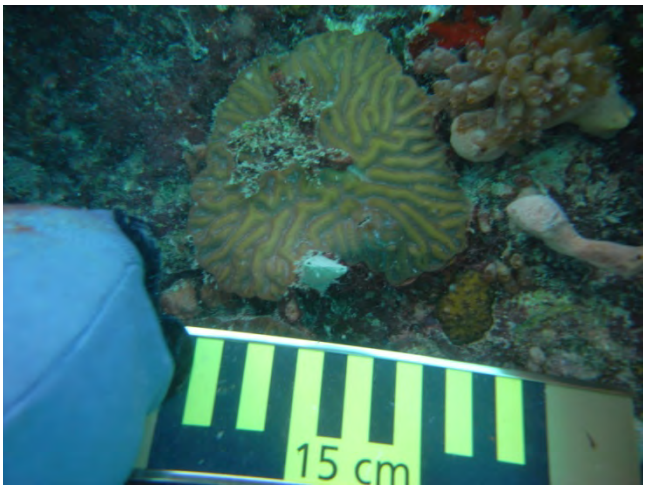
Coral #31 (left) and Coral #32 (right) located on the seawall.

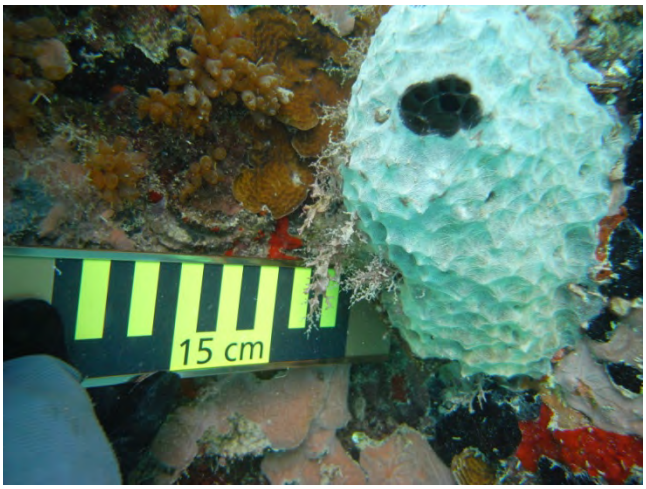


Coral #33 (left) and Coral #34 (right) located on the seawall.

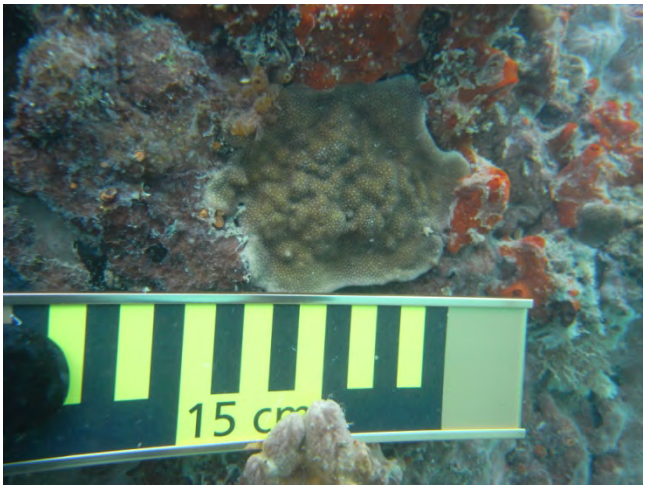



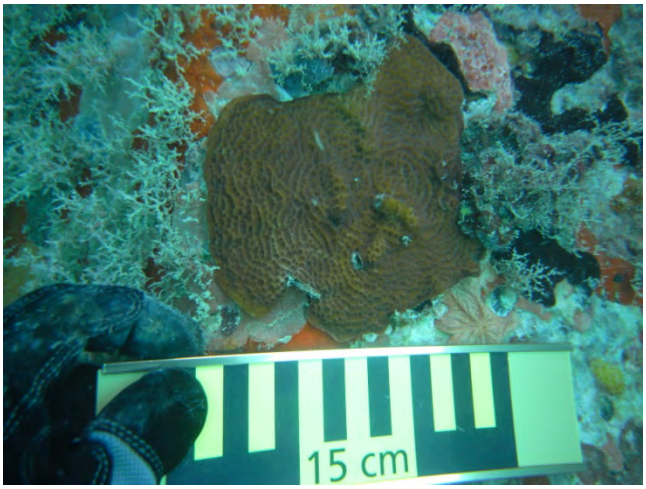
Coral #35 (left) and Coral #36 (right) located on Piling 6.



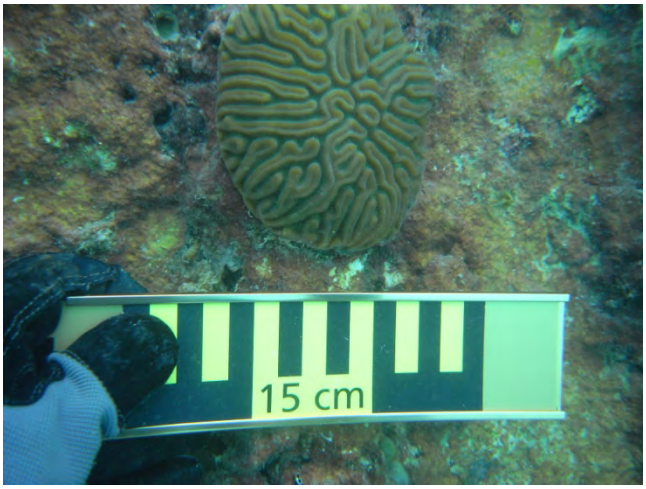


Coral #37 (left), located on Piling 6, and Coral #38 (right), located on Piling 8.

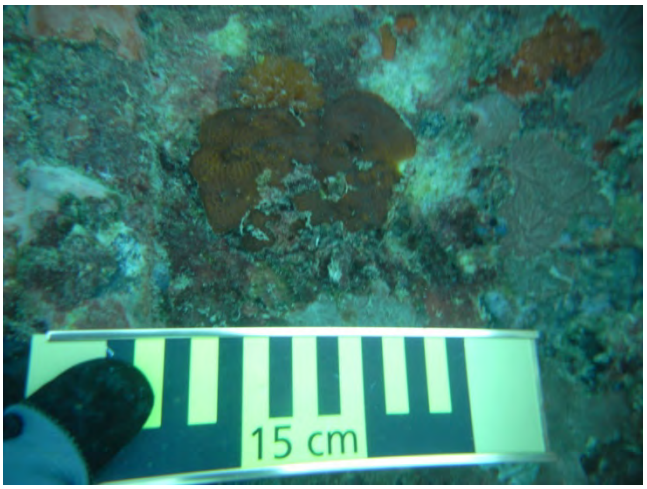




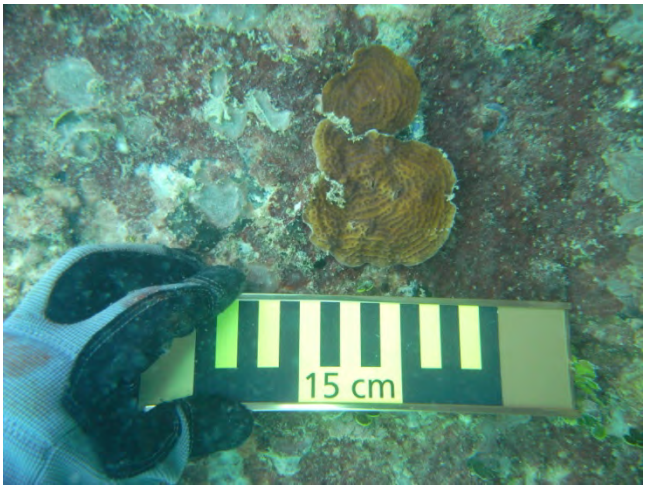
Coral #39 (left), located on Piling 9, and Coral #40 (right), located on the seawall underneath the cargo ramp.

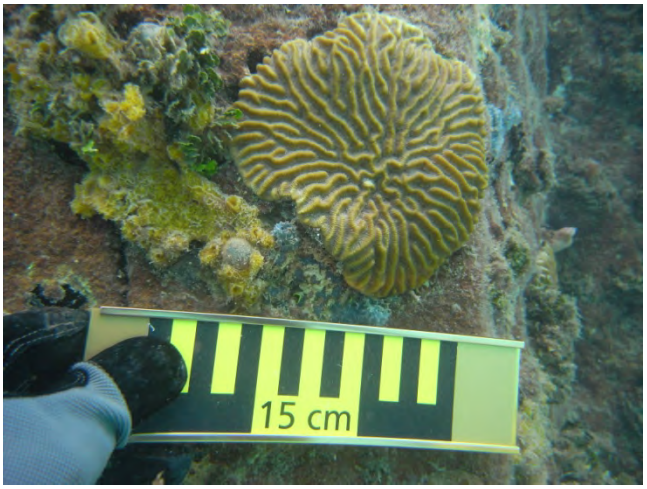


Coral #41 (left) and Coral #42 (right) located on the seawall.

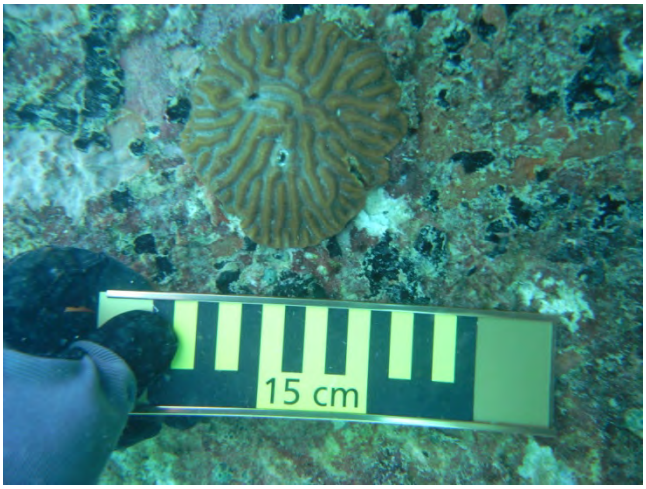


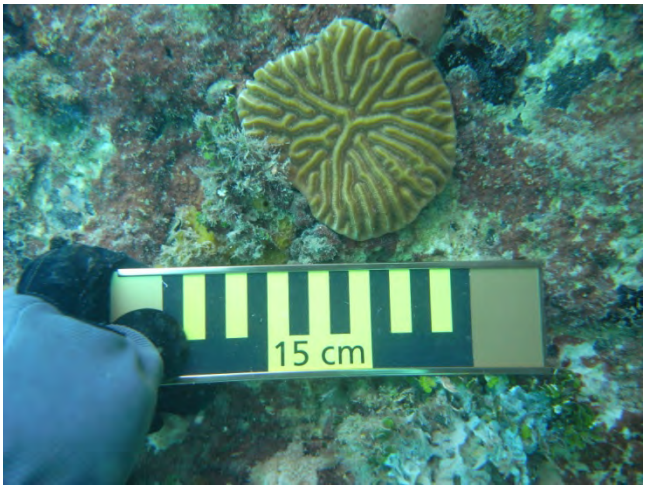
Coral #43 (left) and Coral #44 (right) located on the seawall.



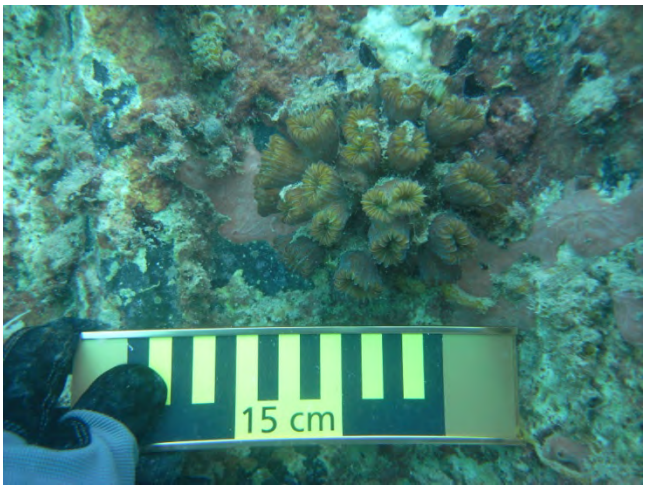


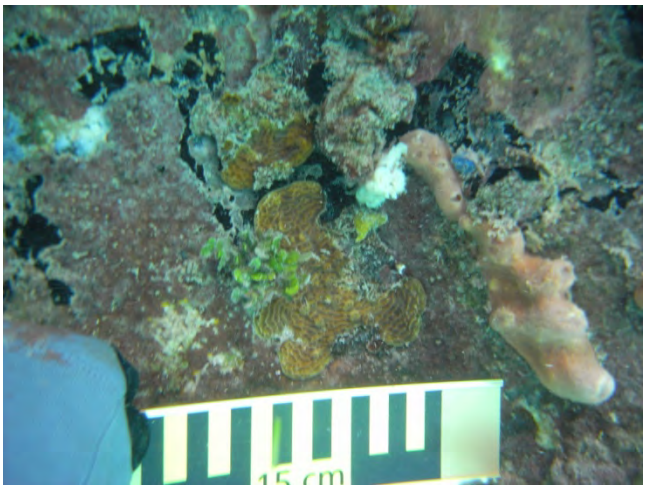
Coral #45 (left) and Coral #46 (right) located on the seawall.



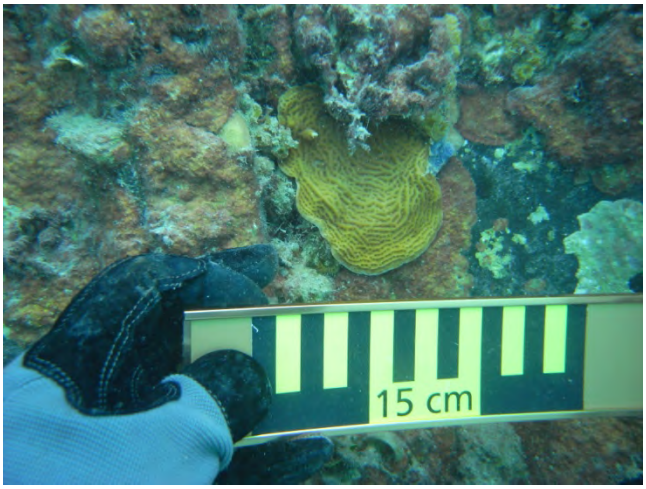


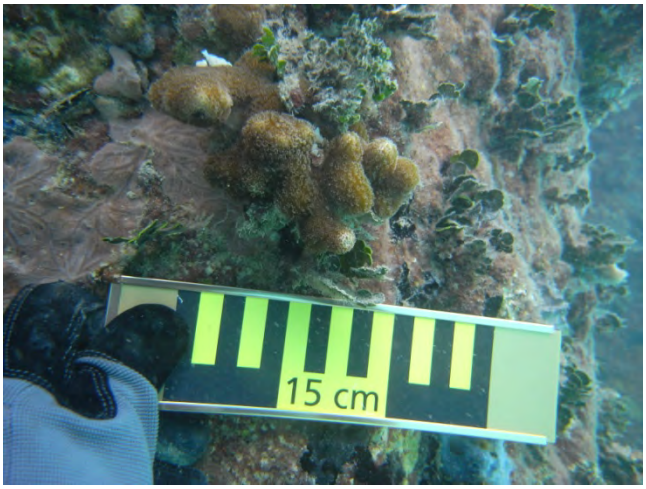
Coral #47 (left) and Coral #48 (right) located on the seawall.



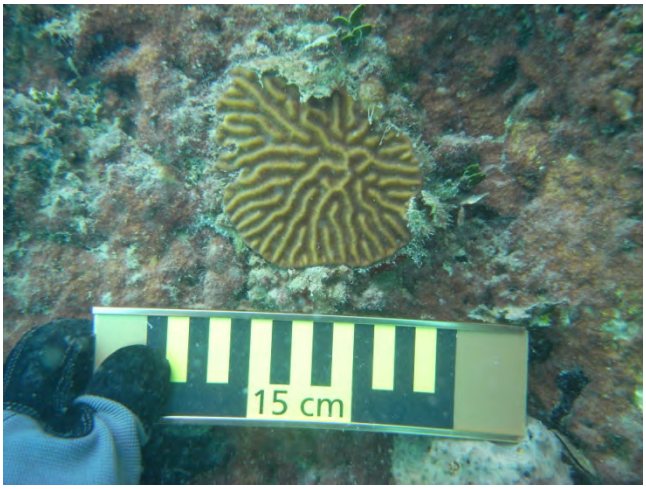


Coral #49 (left) and Coral #50 (right) located on the seawall.

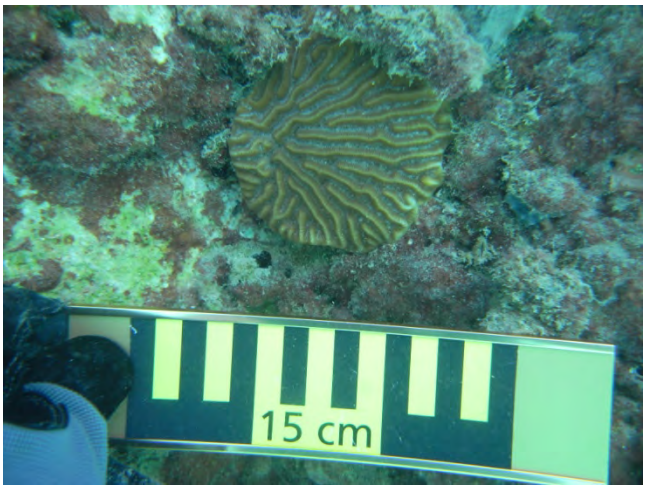


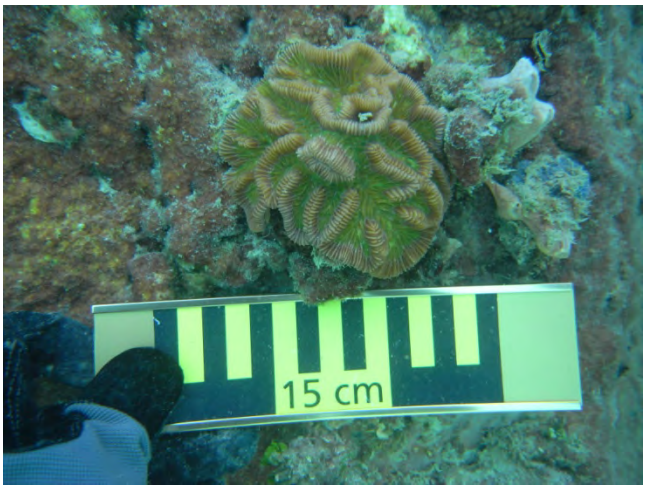


Coral #51 (left) and Coral #52 (right) located on the seawall.

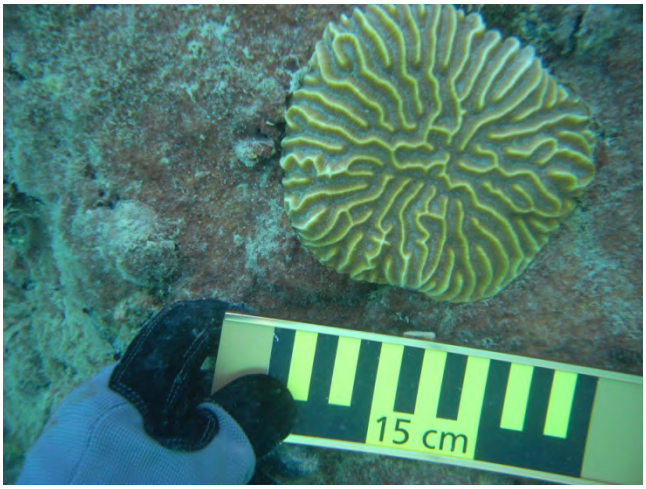


Coral #53 (left) and Coral #54 (right) located on the seawall.

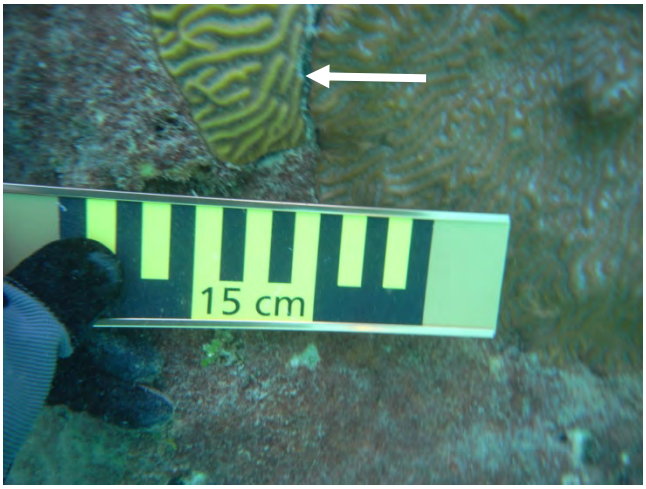




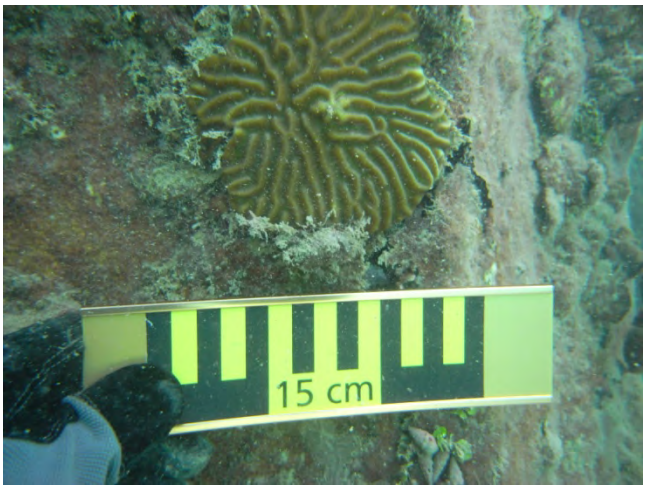
Coral #55 (left) and Coral #56 (right) located on the seawall.

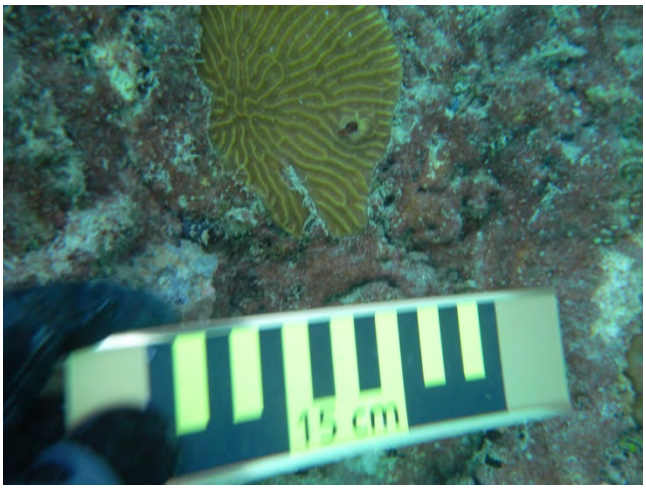


Coral #57 (left) and Coral #58 (right) located on the seawall.

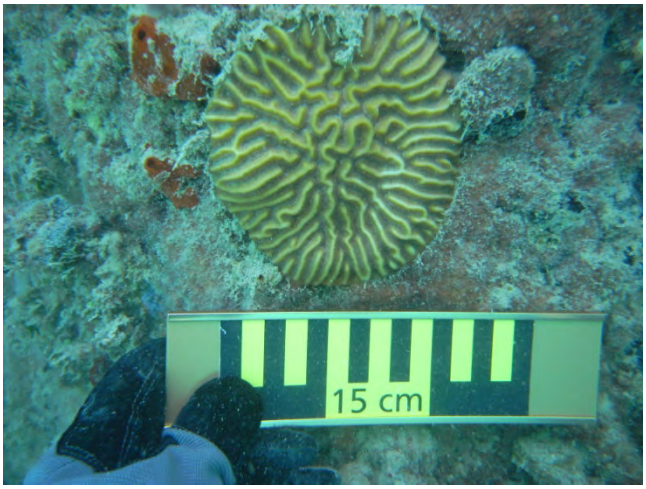


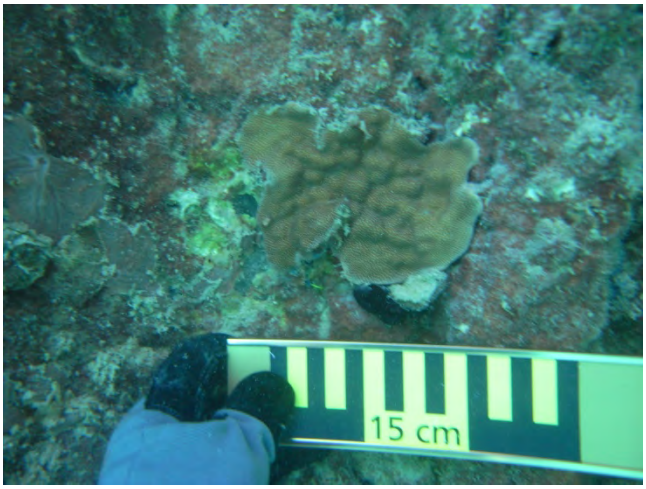
Coral #59 (left) and Coral #60 (right) located on the seawall.



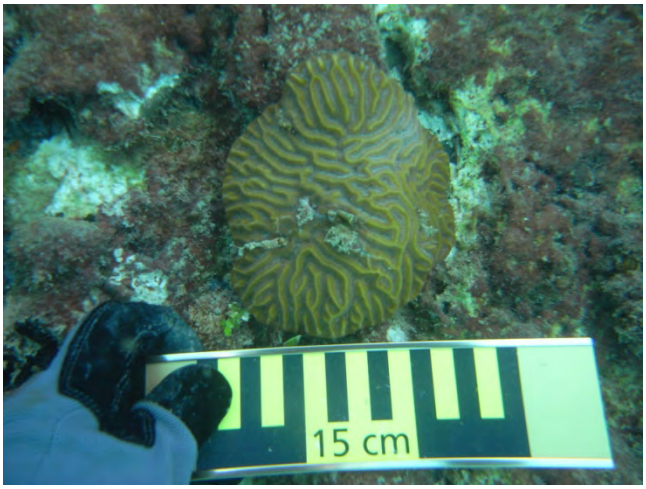


Coral #61 (left) and Coral #62 (right) located on the seawall.



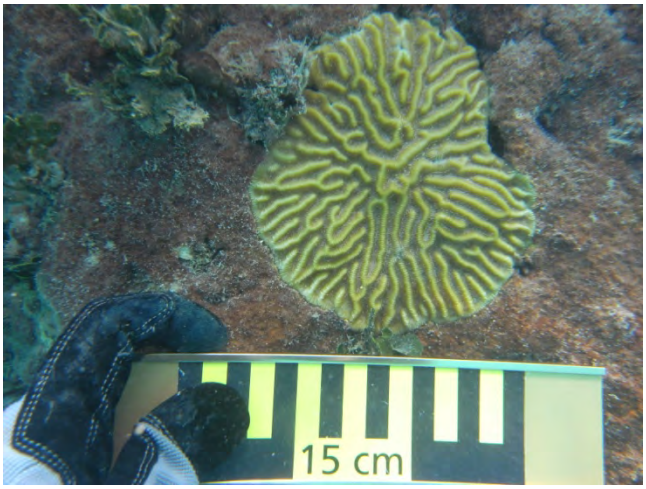


Coral #63 (left) and Coral #64 (right) located on the seawall.

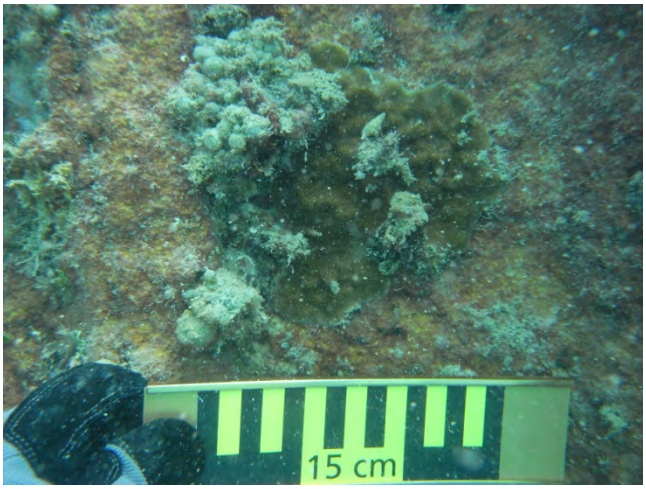


Coral #65 (left) and Coral #66 (right) located on the seawall.

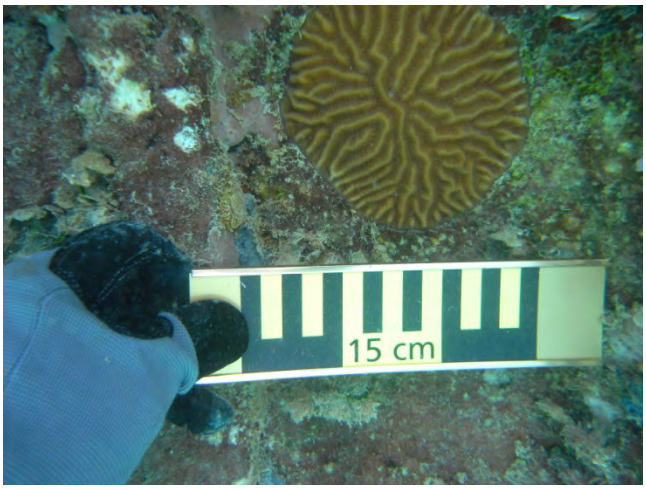
Coral #67 (left) and Coral #68 (right) located on the seawall.

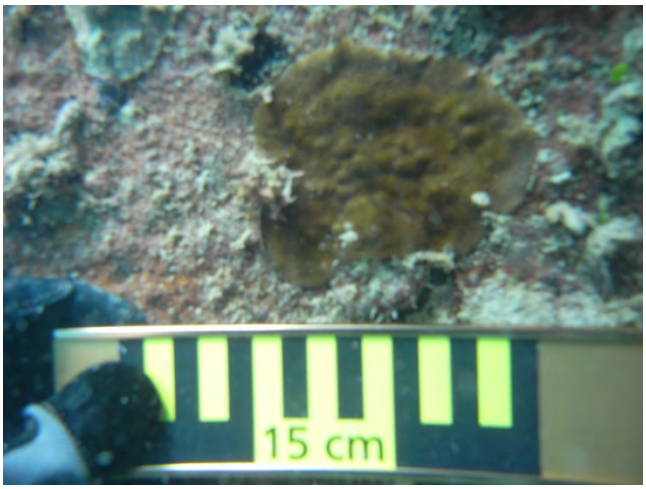


Coral #69 (left) and Coral #70 (right) located on the seawall.

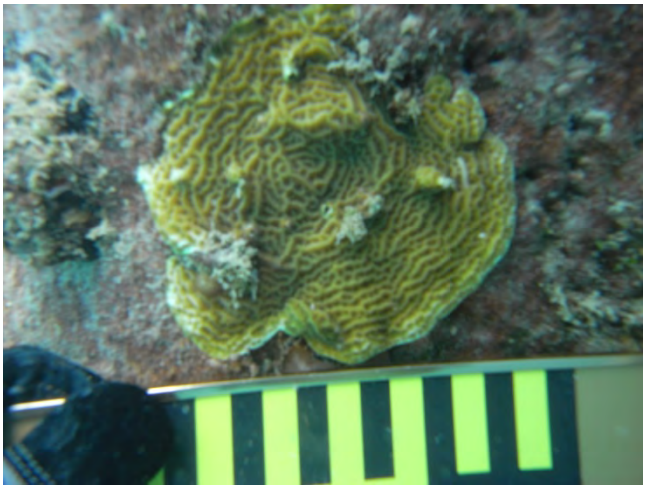
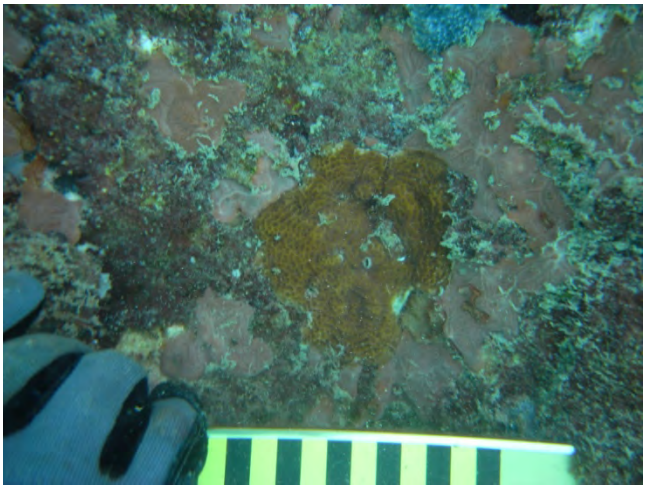


Coral #71 (left) and Coral #72 (right) located on the seawall.

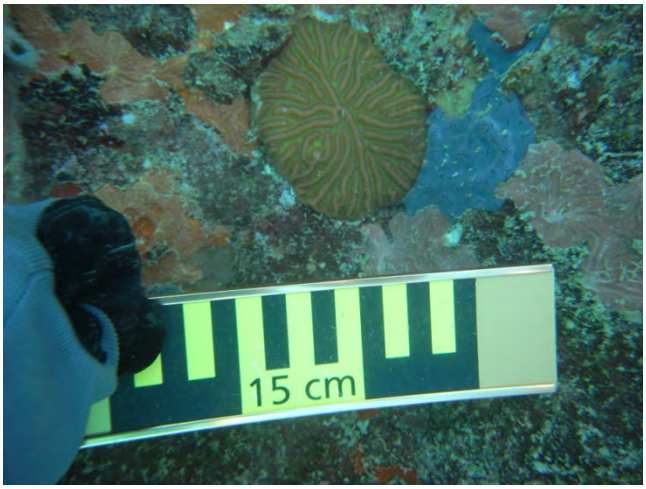


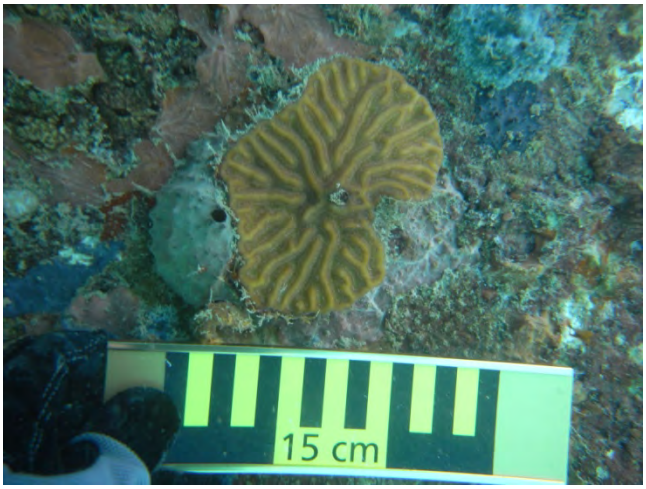


Coral #73 (left) and Coral #74 (right) located on the seawall.

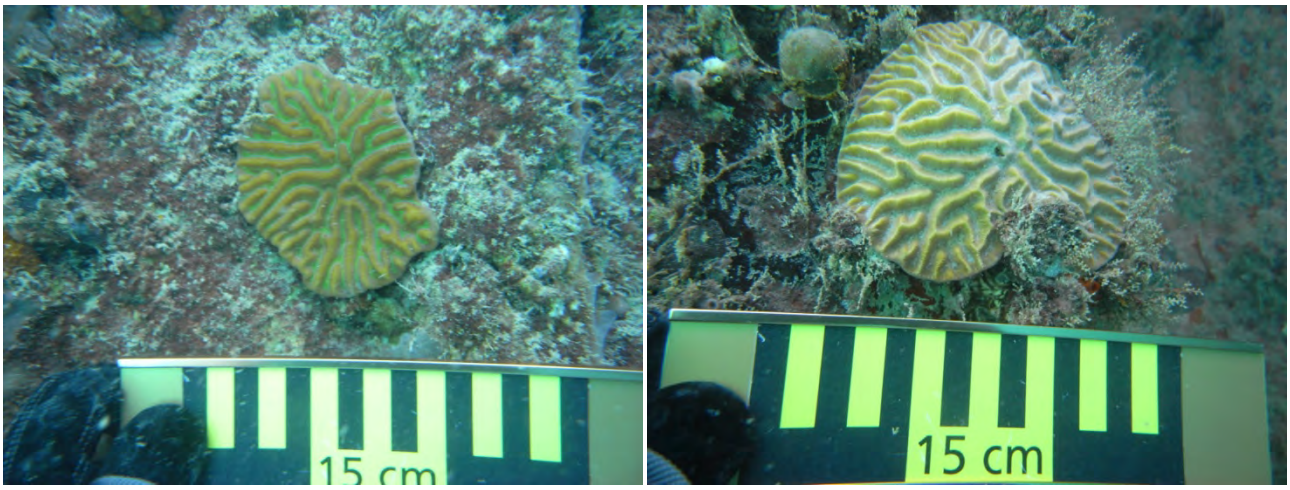



Coral #75 (left) and Coral #76 (right) located on the seawall.





Coral #77 (left) and Coral #78 (right) located on the seawall.



Coral #79 (left) and Coral #80 (right) located on the seawall.